
New Species of *Eleocharis* subgen. *Limnochloa* (Cyperaceae) from the Old and New World Tropics

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ABSTRACT. Two new tropical species in *Eleocharis* subgen. *Limnochloa* (P. Beauv. ex T. Lestib.) Torr. (Cyperaceae) are described and their relationships with presumably allied species are discussed. *Eleocharis hooperiana* D. J. Rosen from Sierra Leone in West Tropical Africa differs from the morphologically similar and presumably close taxonomic ally *E. nupeensis* Hutch. in a combination of coarser culms, longer and more coarsely spinulose perianth bristles, and larger fruits. *Eleocharis tenuiculmis* D. J. Rosen from the Brazilian state of Mato Grosso differs from the similar slender-culmed species *E. elongata* Chapm. in a combination of narrower culms, longer perianth bristles, and generally larger, biconvex fruits.

RESUMEN. Se describen dos nuevas especies tropicales de *Eleocharis* subgen. *Limnochloa* (P. Beauv. ex T. Lestib.) Torr. (Cyperaceae) y se discuten sus relaciones con especies presumiblemente relacionadas. *Eleocharis hooperiana* D. J. Rosen, de Sierra Leona en Africa tropical occidental, difiere de *E. nupeensis* Hutch., una especie morfológicamente similar y presumiblemente cercanamente relacionada, en tener tallos más robustos, cerdas del perianto más largas y más espinulosas, y frutos más grandes. *Eleocharis tenuiculmis* D. J. Rosen, del Estado Brasileño de Mato Grosso, difiere de *E. elongata* Chapm., otra especie de tallos delgados, en una combinación de tallos más delgados, cerdas del perianto más largas, y frutos biconvexos generalmente más grandes.

Key words: Brazil, Cyperaceae, *Eleocharis*, IUCN Red List, Mato Grosso, Sierra Leone, subgenus *Limnochloa*, West Tropical Africa.

Eleocharis R. Br. (Cyperaceae) is a cosmopolitan genus of over 200 species with a center of diversity in the Neotropics (González-Elizondo & Tena-Flores, 2000). *Eleocharis* subgen. *Limnochloa* (P. Beauv. ex T. Lestib.) Torr. is distinguished from other *Eleocharis* by a combination of cartilaginous, obscurely keeled, many-veined floral scales; often large culms that are usually as thick as the cylindrical spikelet; and biconvex (rarely trigonous) achenes usually sculp-

tured with large, polygonal cells (González-Elizondo & Peterson, 1997). A recent resurgence of systematic study in subgenus *Limnochloa* has resulted in the description of several new species, particularly from the New World Tropics (González-Elizondo & Reznicek, 1996; Roalson, 1999; Trevisan & Boldrini, 2006; Rosen et al., 2007; Rosen & Hatch, 2007).

During a systematic study of select species complexes in *Eleocharis* subgen. *Limnochloa* (Rosen, 2006; Rosen et al., 2007), I examined herbarium specimens from West Tropical Africa that were variously annotated as *E. fistulosa* (Poir.) Link (an illegitimate name for *E. acutangula* (Roxb.) Schult.), *E. nupeensis* Hutch., and *E. variegata* (Poir.) C. Presl. After comparing these specimens to authentic specimens and types of the aforementioned taxa, it is my opinion that they represent an undescribed species.

1. *Eleocharis hooperiana* D. J. Rosen, sp. nov.

TYPE: Sierra Leone. [Northern Prov.: Kambia Dist.], near Kuputu (Bramaia), in a stream, 20 Sep. 1949, *H. D. Jordan* 342 (holotype, K). Figure 1A, B.

Haec species *Eleochariti nupeensi* Hutch. affinis, sed culmis longioribus et latioribus, squamis floralibus supernis longioribus, setis hypogynis grosse retrorso-spinulosus fere usque ad basim achenium superantibus, acheniis majoribus atque stylopodio pro ratione longiore differt.

Plants perennial; *roots* fine, fibrous, dark brown; rhizomes elongated, slender, reddish brown, to 1.5 mm thick, scales to 8.5 mm; *culms* terete, (40.5–)49–80 (–83) cm × (1.3–)1.4–2.5 (–2.8) mm, internally spongy, with incomplete transverse septa, brownish green. *Leaves* 2, reduced to sheaths, membranous, loose, friable, pinkish green to cinnamon basally, brownish to stramineous distally, apex of upper sheath acute. *Spikelets* cylindric, obtuse, (16–)17.7–23 (–25) × (2–)2.2–3.1 (–3) mm; proximal scale amplexicaulous and appearing as continuation of culm, remaining floral scales appressed to somewhat loose, ovate, central area rounded from base to near the apex, 4–4.4 (–4.5) × 2.5–2.7 (–2.8) mm, cartilaginous, abaxially stramineous, somewhat darkened centrally,

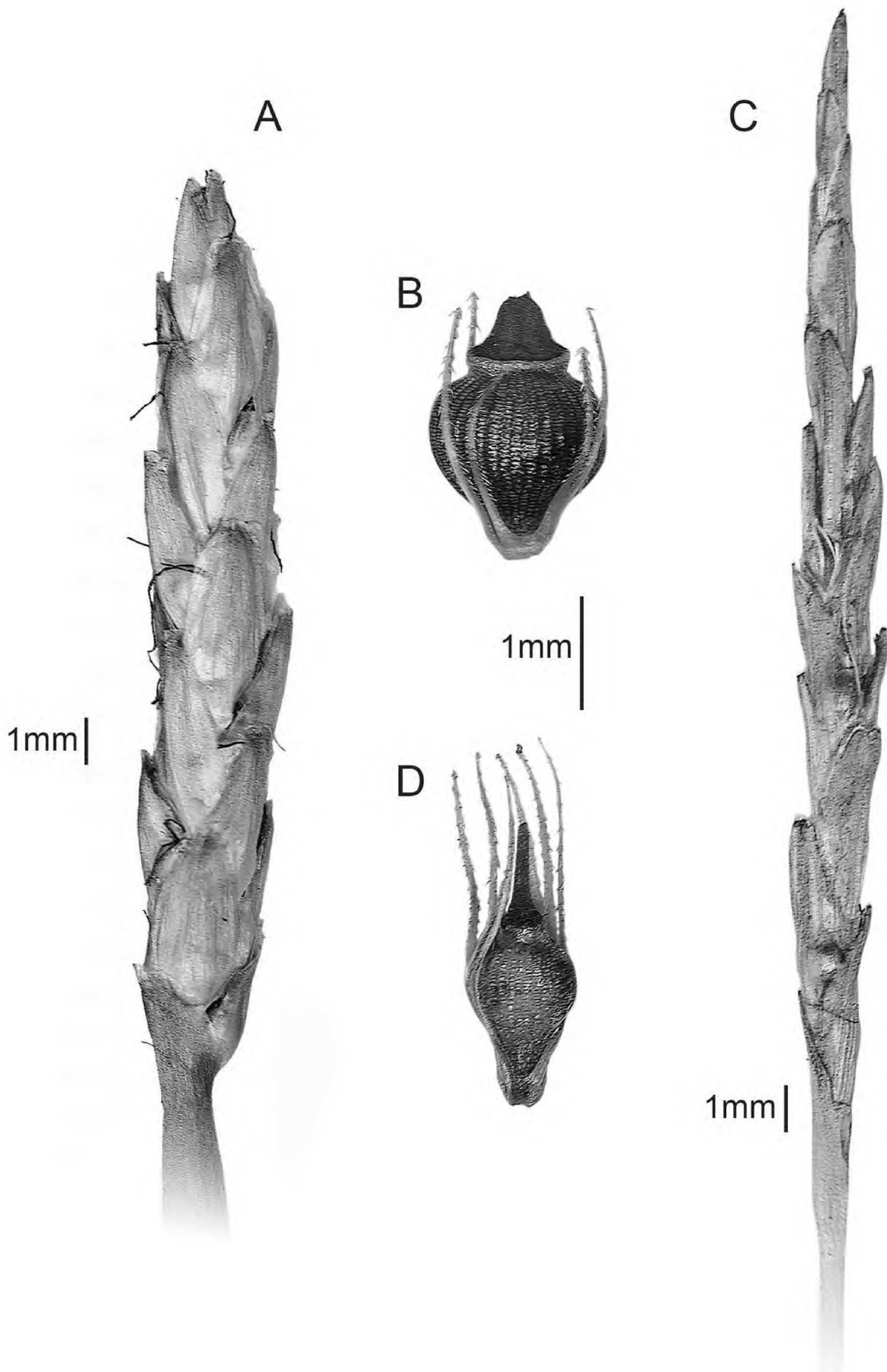


Figure 1. A, B. *Eleocharis hooperiana* D. J. Rosen. —A. Spikelet. —B. Achene. C, D. *Eleocharis tenuiculmis* D. J. Rosen. —C. Spikelet. —D. Achene. A, B from the holotype, *H. D. Jordan* 342 (K); C, D from the holotype, *B. Maguire, J. M. Pires, C. K. Maguire & N. Silva* 56412 (UB).

adaxially stramineous and faintly red-maculate, apex rounded, distal 0.2–0.4 mm translucent hyaline-erose, abaxially coarsely many-veined, adaxially only mid-vein conspicuous. *Flowers* with 6 or 7 perianth

bristles; bristles subequal, usually all overtopping the achene (rarely 1 or 2 just reaching achene summit or slightly shorter), each coarsely retrorsely spinulose nearly to base, stramineous, sometimes streaked with

dark maroon near the tip; stamens 3; anthers (1.4–) 1.6–2.2(–2.4) mm, stramineous; style 2-fid. *Achenes* biconvex, widely obovoid, the shoulders rounded, 1.7–1.8(–2) × (1.3–)1.4–1.6(–1.7) mm, each face with (13)14 to 17 longitudinal rows of deeply concave, transversely oblong cells, pale yellowish, maturing to shiny dark amber or dark grayish brown, apex weakly constricted to about half the width of achene; *stylopodium* dorsoventrally compressed, deltate, with swollen thickening at base, distinctly separated from achene, in some specimens the apex retuse, (0.5–) 0.6–1(–1.1) × 0.8–0.9 mm, 0.6–1.3× longer than wide, stramineous, red-maculate, maturing to dark brown.

Habitat and distribution. Like other species in *Eleocharis* subgen. *Limnochloa*, *E. hooperiana* undoubtedly grows in wetland and aquatic habitats. Collection data for the type specimens provide very little information about the habitat of *E. hooperiana*. Aquatic habitats in the Fouta Djallon of Guinea and lower elevations in Sierra Leone include ponds, seasonal streams, and rivers of highland grasslands and gallery forests (Stefan Porembski, pers. comm.). *Eleocharis hooperiana* is currently known only from the type collections and is presumably endemic to Guinea and Sierra Leone, unlike the more widely distributed *E. nupeensis* from Senegal, Sierra Leone, Ghana, Ivory Coast, Nigeria, and Tanzania (Hooper, 1972; Lowe & Stanfield, 1974; Haines & Lye, 1983). One collection of the new taxon is from Friguiagbé in the Fouta Djallon, a rugged mountainous area in the southeast of Guinea, known to be a center of plant endemism (Beentje et al., 1994).

IUCN Red List category. Too little is known about *Eleocharis hooperiana* to accurately evaluate its conservation status. For now, it seems sufficient to assign a conservation status as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Etymology. The specific epithet of the new taxon is dedicated to Sheila S. Hooper (b. 1925), formerly a taxonomist at the Royal Botanic Gardens, Kew, until her retirement in 1985. Her research focuses on the systematics of Cyperaceae with special emphasis on tropical Africa and India.

Relationships. *Eleocharis hooperiana* appears to be closely related to *E. nupeensis*, differing in possessing generally longer and wider culms, longer floral scales, longer and more coarsely spinulose perianth bristles, slightly larger achenes, and a longer stylopodium.

Taxonomy and affinities. Hooper (1972) treated six species belonging to *Eleocharis* subgen. *Limno-*

chloa in West Tropical Africa: *E. dulcis* (Burm. f.) Trin. ex Hensch., *E. decoriglumis* Berhaut, *E. acutangula*, *E. mutata* (L.) Roem. & Schult., *E. variegata*, and *E. nupeensis*. She considered *E. nupeensis* to be a species of questionable validity in need of further study, because of its unknown relationship with the Latin American *E. tiarata* Gómez-Laur. (as *E. mitrata* Franch. & Sav. ex Makino), *E. variegata*, and *E. acutangula*. Svenson (1939) also suggested that the distinctions among *E. nupeensis*, *E. acutangula* (as *E. fistulosa*), *E. mutata*, *E. variegata*, and *E. calocarpa* Cherm. are not well defined. *Eleocharis nupeensis* and *E. hooperiana* differ markedly from these species in characteristics of the floral scales, the nature of the constriction between the achene and style base (stylopodium), the shape of the achene epidermal cells, and degree of achene surface sculpturing. *Eleocharis nupeensis* and *E. hooperiana* differ from *E. mitrata* in having longer and wider floral scales that are less densely packed and lack a trilobed stylopodium base characteristic of the Latin American species. The following artificial key separates *E. hooperiana* from species with which the taxon has been confused in West Tropical Africa.

ARTIFICIAL KEY TO *ELEOCHARIS HOOPERIANA*

- 1a. Culms triquetrous (sharply 3-angled); achene apex markedly constricted to a short neck *E. acutangula*
- 1b. Culms trigonous (bluntly 3-angled) to terete; achene apex weakly constricted to sub-annulate.
 - 2a. Floral scales with conspicuous translucent apical hyaline-erose region > 0.7 mm wide; styles 3-fid (rarely some 2-fid); achene epidermal cells transversely widely oblong, inflated, the achene surface appearing smooth; stylopodium arising from central sunken region of truncate to sub-annular summit of achene. *E. variegata*
 - 2b. Floral scales with apical hyaline-erose region 0.2–0.4 mm wide; styles 2-fid; achene epidermal cells narrowly transversely oblong, concave, the surface with conspicuous longitudinal ridges; stylopodium with swollen thickening at base but distinctly separated from achene by a weak constriction and not arising from central sunken region of truncate to sub-annular summit of achene.
 - 3a. Culms (40.5–)49–80(–83) cm × (1.3–) 1.4–2.5(–2.8) mm; floral scales 4–4.4 (–4.5) mm long; perianth bristles subequal, usually all overtopping the achene (rarely 1 or 2 just reaching its summit or slightly shorter), coarsely, retrorsely spinulose nearly to base; achene 1.7–1.8(–2) × (1.3–)1.4–1.6 (–1.7) mm; stylopodium 0.6–1.3× longer than wide *E. hooperiana*
 - 3b. Culms 30–50 cm × 0.5–1 mm; floral scales 3.5–4 mm long; perianth bristles markedly unequal, usually all less than half the length of the achene or shorter

(some rudimentary), smooth or with a few retrorse spinules near the tips; achene ca. $1.6 \times$ to 1.2 mm ; stylopodium $0.3\text{--}0.5\times$ longer than wide. *E. nupeensis*

Paratypes. REPUBLIC OF GUINEA. [Kindia:] Fri-guiagbé, 6 Apr. 1938, J. Chillou 697 (C). SIERRA LEONE. [Northern Prov.:] near Kambia, in water in rocky pool in stream, 3 Sep. 1949, H. D. Jordan 306 (K [2]).

My study of *Eleocharis* specimens at Centro Interdisciplinario de Investigación para el Desarrollo Integral Regional (CIIDIR) during 2005 and 2007 led to the discovery of a specimen that had been previously annotated as *Eleocharis* aff. *brasiliensis* Boeckeler by Socorro González-Elizondo with a few notes about the differences from that species, indicating that she recognized that it probably represented a new species. This specimen and four duplicates retained at NY are the basis for the remarkably distinct new slender-culmed species described below.

2. *Eleocharis tenuiculmis* D. J. Rosen, sp. nov.
TYPE: Brazil [Centro-Oeste region]. Mato Grosso: submerged in running water, 50 km W of Diamantino, watershed 700–900 m alt., Brasília–Acre Hwy., 30 Aug. 1963, B. Maguire, J. M. Pires, C. K. Maguire & N. Silva 56412 (holotype, UB; isotypes, CIIDIR, MO, NY, TAES). Figure 1C, D.

Haec species *Eleochariti elongata* Chapm. similis, sed ab ea culmis angustioribus, squamis floralibus supernis laxius imbricatis, setis hypogynis longioribus, acheniis biconvexis plerumque majoribus atque stylopodio majoribus differt.

Plants slender perennials; *roots* fine, fibrous, dark brown; *rhizomes* elongated, slender, dark reddish brown, to 1.2 mm thick, scales loose, friable; *culms* terete, $28\text{--}38 \text{ cm} \times 0.5\text{--}0.7 \text{ mm}$, internally spongy, with incomplete transverse septa, light green to brownish green. *Leaves* 2, reduced to sheaths, membranous, reddish green to cinnamon basally, brownish to stramineous distally, apex of upper sheath acute. *Spikelets* cylindric, about as wide as one floral scale, $(18\text{--})20\text{--}27(29) \times 0.8\text{--}1.9(2) \text{ mm}$; proximal scale with a flower, amplexicaulous, somewhat loose and the tip sometimes slightly divergent, remaining floral scales appressed to somewhat loose, weakly imbricate, elliptic, central area rounded from base to near the apex, $3.7\text{--}4.3(4.6) \times (1\text{--})1.4\text{--}1.9(2) \text{ mm}$, cartilaginous, abaxially greenish, marginally and adaxially stramineous and sparsely red-maculate, apex rounded, distal ca. 0.2 mm translucent hyaline-erose, abaxially finely many-veined, adaxially only midvein conspicuous. *Flowers* with (5)6 perianth bristles, the longest 3–4 mm, subequal, usually all overtopping the stylopodium, as much as $1.7\times$ longer

than fruit, each coarsely retrorsely spinulose nearly to base, stramineous; stamens 3; anthers to 1.3 mm , stramineous; style 2-fid. *Achenes* biconvex, obovoid to pyriform, the shoulders rounded, the margins costate or nearly so, $1.4\text{--}1.7(1.9) \times \text{ca. } 1 \text{ mm}$, each face with 13 to 15 longitudinal rows of deeply concave, transversely oblong cells, shiny, greenish, maturing to light brown, apex conspicuously constricted to ca. $0.4\times$ the width of achene; *stylopodium* dorsoventrally compressed, narrowly triangular, distinctly separated from achene, $0.7\text{--}1 \times 0.3\text{--}0.5(0.6) \text{ mm}$, dark brown.

Habitat and distribution. Like other species in *Eleocharis* subgen. *Limnochloa*, *E. tenuiculmis* undoubtedly grows in wetland and aquatic habitats. Collection data for the type specimen indicate only that it was collected from running water.

IUCN Red List category. Too little is known about *Eleocharis tenuiculmis* to accurately evaluate its conservation status. For now, it seems sufficient to assign a conservation status as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Etymology. The specific epithet indicates the remarkably slender culms of the species.

Relationships. *Eleocharis tenuiculmis* is morphologically very similar to *E. elongata* Chapm. in possessing very slender culms, but differs in having spikelets with floral scales that are less markedly overlapping, longer perianth bristles, and generally larger, biconvex fruits.

The following artificial key modified from Svenson (1939) will help separate *Eleocharis tenuiculmis* from *E. elongata* and other slender-culmed species of *Eleocharis* subgen. *Limnochloa* in South America with which it might be confused.

ARTIFICIAL KEY TO *ELEOCHARIS TENUICULMIS*

- 1a. Achenes compressed trigonous (the abaxial angle sometimes costate) or rarely biconvex, $0.65\text{--}1.4 \text{ mm}$ long, floral scales usually with a conspicuous dark brownish black submarginal band. *E. elongata*
- 1b. Achenes biconvex, usually 1.4 mm long or longer, floral scales without or with a faint submarginal darkened band.
 - 2a. Culms terete; floral scales abaxially many-veined, the veins slightly to conspicuously raised and visible at $20\times$; achene constricted below the stylopodium, sometimes weakly so in *E. tenuiculmis* and *E. tiarata*.
 - 3a. Perianth bristles usually all less than half the length of the achene or shorter, smooth; style base trilobed. *E. tiarata*
 - 3b. Perianth bristles longer than achene, coarsely retrorsely spinulose; style base not trilobed.

- 4a. Culms 0.5–0.7 mm wide; perianth bristles as much as 1.7× longer than fruit; achenes greenish to light brown, each face with 13 to 15 longitudinal rows of epidermal cells. *E. tenuiculmis*
- 4b. Culms 0.5–2.1 mm wide; perianth bristles about as long as fruit, seldom any overtopping the stylopodium; achenes maturing to dull blackish brown, each face with about 12 rows of epidermal cells.
. *E. jelskiana* Boeckeler
- 2b. Culms trigonous; floral scales abaxially cellular-lineate, raised veins not evident at 20×; except for the centermost, achene not constricted below the stylopodium
. *E. plicarhachis* (Griseb.) Svenson

Acknowledgments. I am grateful to the staff of the herbaria cited for loan of specimens for study. I am especially grateful to Socorro González-Elizondo for hosting my visits to CIIDIR and preparing the Spanish abstract, Rafael Trevisan for providing the Latin diagnoses and for our many helpful conversations regarding tropical *Eleocharis*, Ib Friis for providing information about Chillou's collection, Martin Xanthos for providing images of the type of *E. nupeensis*, Kanchi Gandhi and David Simpson for sharing information about Sheila Hooper, Thomas Zanoni for providing additional syntypes of *E. tenuiculmis* for me to study, and Stefan Porembski for helpful discussion about the ecology of Tropical West Africa. The comments of Ilsi Boldrini, Victoria C. Hollowell, and Galen Smith were helpful in preparation of the final manuscript. Special thanks to Neva Mikulicz for preparing the illustration.

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